

EFFECT OF A FUNCTIONAL FITNESS EXERCISE PROGRAM ON OBSTACLE NEGOTIATION IN THE ELDERLY

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INTRODUCTION

Falls and fall-related injuries are a major medical problem in elderly people [1]. Tripping over obstacles during walking has been documented as one of the most frequent causes of falls [2]. Hence, how to cross obstacle safely is important for the elderly. There are multiple factors associated with obstacle negotiation, such as muscle strength, coordination, flexibility and balance. Functional fitness exercise program for the senior, designed with the guidelines of American Council on Exercise and YMCA, consisted of strengthening, coordination, flexibility and balance exercises. Therefore, the purpose of this study was to evaluate the effect of a 12-week functional fitness exercise program on obstacle negotiation in community-living older adults. Our hypothesis was that the intervention of function fitness exercise program would improve the ability of obstacle negotiation in the elderly.

METHODS

Eleven ambulatory community-dwelling elderly subjects (8 females and 3 males) participated in this study. Their average age, body length and body weight were 69.8 ± 10.0 years, 156.2 ± 8.5 cm and 56.6 ± 9.1 kg, respectively. They underwent supervised functional fitness chair exercise program. The program included aerobic, strengthening, flexibility, balance and coordination exercises with the use of chair. Exercise session was held twice weekly for 12 weeks. Obstacle negotiation was performed in pre- and post-intervention. The outcome measures were the foot clearance (vertical difference between toe and obstacle) during stepping over obstacle.

Vicon Nexus motion analysis system (Vicon Nexus motion analysis system, Oxford Metrics LID, UK) with eight digital cameras was used to record the trajectory of the reflective markers attached on the anatomical landmarks of each subject. The sampling rate was 100 Hz. Each subject was asked to perform obstacle crossing in three different obstacle heights (H1: 10% leg length; H2: 20% leg length; H3: 30% leg length). Paired-t test was used to compare the difference between pre- and post-intervention. $P < 0.05$ was considered as statistical significance.

RESULTS AND DISCUSSION

Foot clearance of leading limb and trailing limb in pre- and post-intervention were shown in Figures 1 and 2, respectively. Post-intervention showed significantly greater foot clearance than pre-intervention in the obstacle height at 10% leg length ($p < 0.05$). This finding was both found in leading limb and trailing limb. No significant difference between pre- and post-intervention was found in H2 and H3. It was implied that functional fitness exercise program for the elderly was effective in improving the obstacle negotiation when stepping over lower obstacle but not effective in stepping higher obstacle.

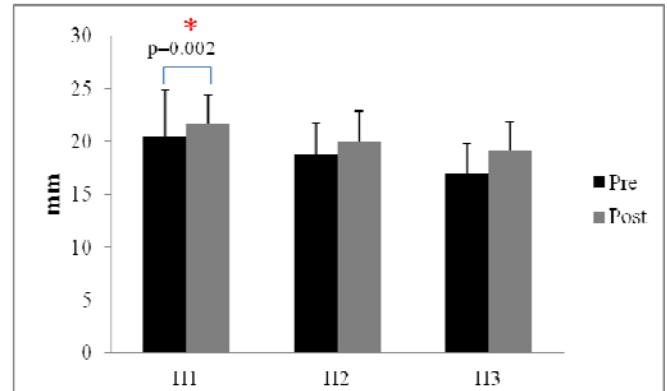


Figure 1: Foot clearance of leading limb in pre- and post-intervention.

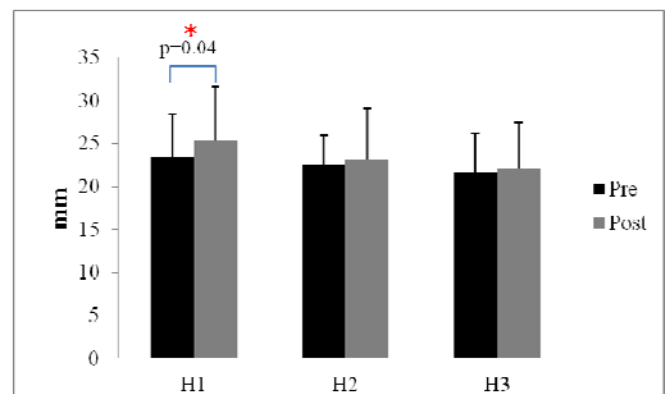


Figure 2: Foot clearance of trailing limb in pre- and post-intervention.

Obstacle negotiation is a complex movement for elderly people. A further study will be conducted to analyze the kinematics and kinetics of the lower limbs to understand how the functional fitness exercise program alters the obstacle crossing behavior in elderly people.

CONCLUSIONS

This study found that a 12-week functional fitness exercise program increased the foot clearance of the leading limb and trailing limb during stepping over an obstacle of 10% leg length. Functional fitness exercise would be beneficial for the elderly to improve the ability of obstacle negotiation and reduce the risk of fall.

REFERENCES

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